iontophoretic current gradient (7.5 mA) from the same balloon. 5 μCi (2 mg) was given systemically; for local delivery 2.5 μCi (1 mg) was given in each artery. One artery was harvested at 10 min and the second at 4 hr, and radioactivity was assessed in a γ-counter. Studies of binding of ^{125}I-labeled ReoPro® to isolated baboon platelets were also performed.

Results. A small amount of ReoPro® was taken up in balloon-injured brachial arteries by systemic delivery. However, there was about 40-fold higher uptake with both passive and active local delivery at 10 min, with sustained 4- to 14-fold higher retention at 4 hr. Data are cpm/mg tissue for entire artery.

	10 minutes	p vs systemic	4 hours	p vs systemic
Systemic infusion	2.5 ± 3.2	–	6.5 ± 10.5	–
Passive local	97.0 ± 86.6	0.057	26.6 ± 7.0	0.019
Active local	111.9 ± 36.2	0.029	89.7 ± 69.2	0.057

Binding studies showed the number of receptors/platelet was 32,827 ± 4,908. The dissociation constant (K^3) for the affinity-purified, dialyzed ^{125}I-labeled ReoPro® ranged from 2.7 to 9.8 nM (n = 4, 6.2 ± 3.0 nM).

Conclusions. Local delivery whether by passive or active iontophoretic means enhances the deposition and retention of anti-platelet antibodies at sites of arterial balloon injury. Further studies are needed to determine whether active iontophoresis can significantly improve retention, and whether this strategy can reduce platelet recruitment and even neointimal proliferation.

1216-86 Local Delivery of Heparin Into Rabbit Carotid Artery With a Novel Electroporation Catheter

N.B. Dev[1,2], T.J. Preminger[2], G.A. Hofmann[1], S.B. Dev[1]. [1]*Division of Pediatric Cardiology, University Hospital Cleveland, Cleveland, OH, USA.* [2]*Genetronics, Inc., San Diego, CA, USA*

Background. Effective local delivery of a drug at the site of the arterial lesion has been hampered by its rapid wash-out. We hypothesized that deployment of an electroporation (EP) catheter would strongly favor penetration and retention of the agent into arterial wall and overcome the problem of the drug going into systemic circulation.

Methods. A double balloon EP catheter has been developed where one coiled electrode is placed between the two balloons and a clinical guidewire is used as the second electrode. These are connected to a BTX exponential generator which delivers short pulses. Two methods have been successfully carried out in normal arteries of New Zealand white rabbits (n = 20), where both fluoresceinated and commercial heparin is introduced endoluminally: (i) in the cervically exposed carotids in retrograde mode (n = 14) and (ii) through the femoral artery (n = 6) under fluoroscopic guidance in anterograde mode, *in vivo*, with continuous EKG monitoring. One artery in each pair is pulsed (50 V, 4 × 8 ms pulses) during heparin delivery. The contralateral artery serves as a control and is not pulsed. Arteries are harvested at different time periods for confocal and epifluorescence analysis.

Results. EP does not cause any EKG abnormality. There is no damage to the vessel architecture. Penetration of heparin is deep in the media and adventitia, and retention is longer in the pulsed arteries in contrast to the control samples where a rapid wash-out of heparin is seen.

Conclusions. Local electroporation is very effective both for increased uptake and retention of heparin.

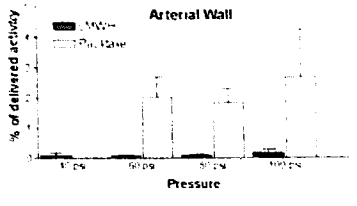
1216-87 Local Drug Delivery: Impact of Substance Characteristics on Drug Transfer Into the Arterial Wall

A. Baumbach, C. Herdeg, M. Oberhoff, K.K. Haase, M. Kluge[1], C. Wolter[1], S. Schroder, K.R. Karsch. *University of Tubingen, Germany.* [1]*Knoll AG, Ludwigshafen, Germany*

Background. Injection parameters for local drug delivery are frequently determined by studies with marker substances. The pharmacologic properties of the actual drug may influence delivery efficiency and lead to different results.

Methods. Radiolabelled (^{3}H) preparations (5 ml) of the hydrophylic low molecular weight heparin reviparin (LMWH) and the lipophilic taxane paclitaxel were injected into the left anterior descending artery of a freshly explanted porcine heart with the Infusasleeve II. A balloon support pressure of 6 atm and infusion pressures of 40, 60, 80 or 100 psi were used (N = 5 for each group). Arteries along with surrounding myocardium were harvested, homogenized, and activity was measured.

Results are shown in the figure.



For LMWH the concentration in the arterial wall was 20 times higher than in the myocardium. For paclitaxel the factor was 165.

Conclusion. The characteristics of the delivered drug contribute largely to the delivery efficiency. Using identical injection parameters, drug concentrations in the arterial wall were significantly higher for the lipophilic paclitaxel as compared to the hydrophilic LMWH.

1216-88 Results of Prospective Randomized Study of Local Enoxaparin Delivery Versus Systemic Heparinization for NIR Stent Placement

R.S. Kiesz, E. Deutsch, P. Buszman, J. Martin, M.M. Rozek, M. Rewicki, P. Seweryniak, M. Kusmider, M. Tendera. *UTHSC at San Antonio, Cornell Medical Center, Silesian Cardiology Centre, Katowice, Bryn Mawr Hospital, Cardiology Institute, Internal Ministry Hospital, Warsaw, Lodz Medical School, Poland*

We postulated that local delivery of enoxaparin via Transport catheter (LE) without full systemic heparinization, prevents stent thrombosis and may have antiproliferative properties reducing restenosis rates. Randomization of 100 pts into LE and systemic heparinization (SH) groups is in progress. LE group received 2,500 U Heparin IV and 10 mg of enoxaparin to the treated site during predilation and SH group 10,000 U Heparin IV, both prior to NIR stent placement. Data (mean ± SD) are presented on 66 pts (48 M, 18 F), age 53.4 ± 8.5 years. 33 pts in LE and 33 in SH group. Baseline ACT's were: 94.6 ± 40.6 in LE group, 120.9 ± 48.9 sec in SH group (NS). After 2,500 U of Heparin IV, ACT was 257.8 ± 168.3 sec, and after enoxaparin ACT was 295.2 ± 168.3 (NS). Final ACT's were: 179.8 ± 106.4 in LE and 360.1 ± 228.9 sec in SH ($p < 0.001$). In SH group reference dia was 2.87 ± 0.38 mm, post stent MLD rose from 0.78 ± 0.33 to 2.53 ± 0.35 mm, and the DS fell from 72.9 ± 11.1% to 9.1 ± 8.6% (both $p < 0.001$). In LE group reference dia was 2.99 ± 0.42 mm, post stent MLD rose from 0.85 ± 0.38 mm to 2.57 ± 0.35, and the DS fell from 71.1 ± 12.6% to 10.7 ± 6.8% (both $p < 0.001$). Acute gain was 1.75 ± 0.41 in SH and 1.72 ± 0.50 mm in LE group (NS). There was no increase in the procedure time when using local drug delivery: 72.1 ± 36.1 min in LE group vs 67.0 ± 35.8 min SH group (NS), however sheaths were removed significantly earlier in LE group: 110.5 ± 49.0 min vs 389.0 ± 113.3 min in SH group ($p < 0.001$). No death, acute MI, emergent CABG, subacute stent closure or groin complications have occurred in either group at the time of procedure and during 30 days of follow-up.

Conclusions. Results of NIR stent deployment were comparable in both groups and reflected substantial acute MLD gain. Effective local drug delivery is suggested since there was no increase of ACT after enoxaparin, and no stent thrombosis had occurred in LE group. LE strategy was associated with earlier ambulation. Six months angiographic follow-up will be available.

1217 Intravascular Ultrasound Doppler Flow and Other New Techniques

Wednesday, April 1, 1998, 3:00 p.m.–5:00 p.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: 3:00 p.m.–4:00 p.m.

1217-59 Assessment of Balloon Angioplasty in Intrastent Restenosis With Intra Coronary Ultrasound

F. Schiele, N. Meneveau, A. Vuillemenot, S. Gupta, D.D. Zhang, C. Xu, J.-P. Bassand. *Hôpital Saint-Jacques, Besançon, France*

Optimal treatment of restenosis occurring after coronary stenting, is not yet clear even if balloon angioplasty (PTCA) has been demonstrated safe and efficient. The mechanism of balloon angioplasty in intrastent restenosis was studied with serial quantitative coronary angiography (QCA) and intracoronary ultrasound (ICUS) in 43 pts. All pts were dilated with a non compliant balloon inflated at high pressure (>15 atm). QCA and ICUS data were available for all pts at stent implantation (basal), before (control) and after repeat PTCA (final). Minimal lumen diameter (MLD) was assessed with QCA, stent cross-sectional area, reference and stent lumen area and neointimal tissue area (stent area – lumen area) with ICUS.

A significant increase in MLD and lumen CSA was achieved after rePTCA, but lumen size remained at a lower level than at stent implantation. After balloon re-PTCA, there was a significant increase in stent area (7.6 ± 2.9 vs 9.0 ± 2.4 mm) and the neointimal tissue area remained unchanged (3.9 ± 2.3 vs 3.7 ± 2.4).